

529-6.

R. GILPIN
Dec. 27 1912

BETTER HEAT AT LESS COST

In Cottage or
Skyscraper

Heating system



[BLANK PAGE]



CCA

697.5

Better Heat at Less Cost

by means of

The Reliable Vacuum System

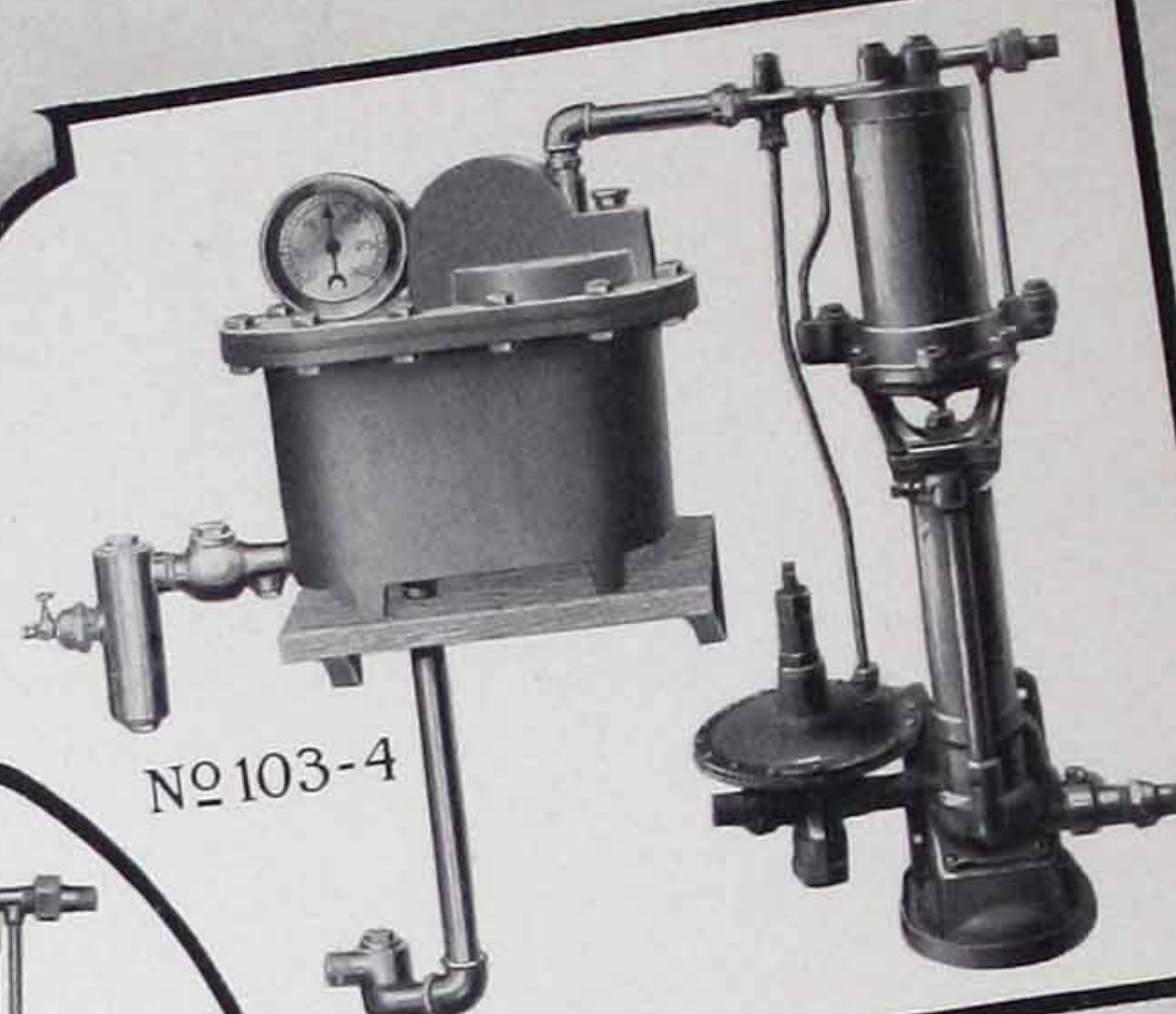


THE BISHOP-BABCOCK-BECKER CO.

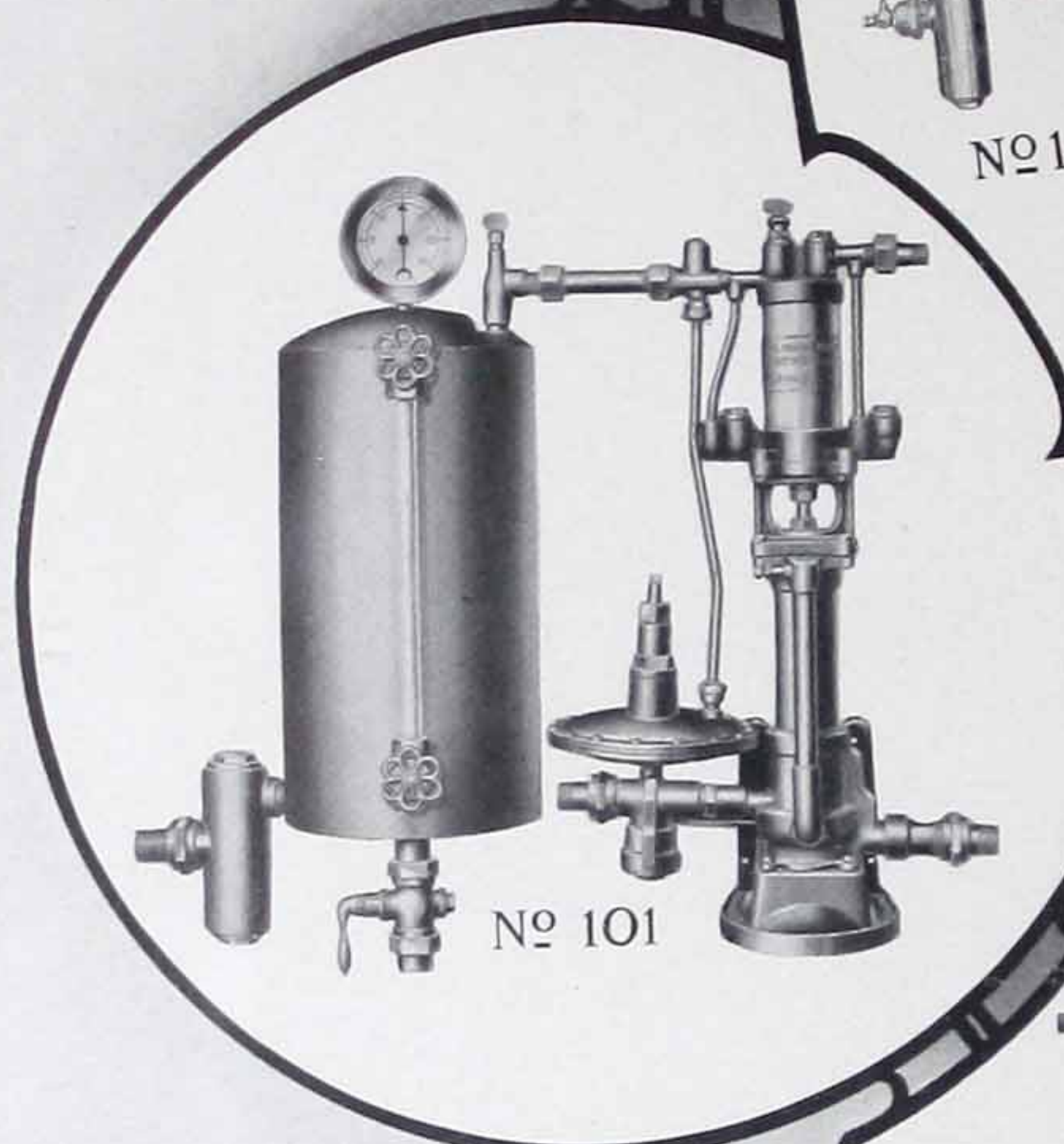
49th Street and Hamilton Ave.,	-	Cleveland
439-441 Lafayette Street,	-	New York
219-225 West Washington Street,	-	Chicago
56-60 East Fifth Street,	-	St. Paul
229 Cedar Street,	-	Milwaukee
Washington and Causeway Streets,	-	Boston
Broadway and Beaver Streets,	-	Albany
16th Street and Sherman Drive,	-	Indianapolis
225-227 West Fourth Street,	-	Cincinnati
1106 Commerce Street,	-	Dallas
210-212 South Broadway,	-	St. Louis
960-962 Mission Street,	-	San Francisco

FRANKLIN
INSTITUTE
LIBRARY

No.103-104
Reliable Hydraulic
Vacuum Pump
*FOR BUILDINGS OF
MODERATE SIZE*



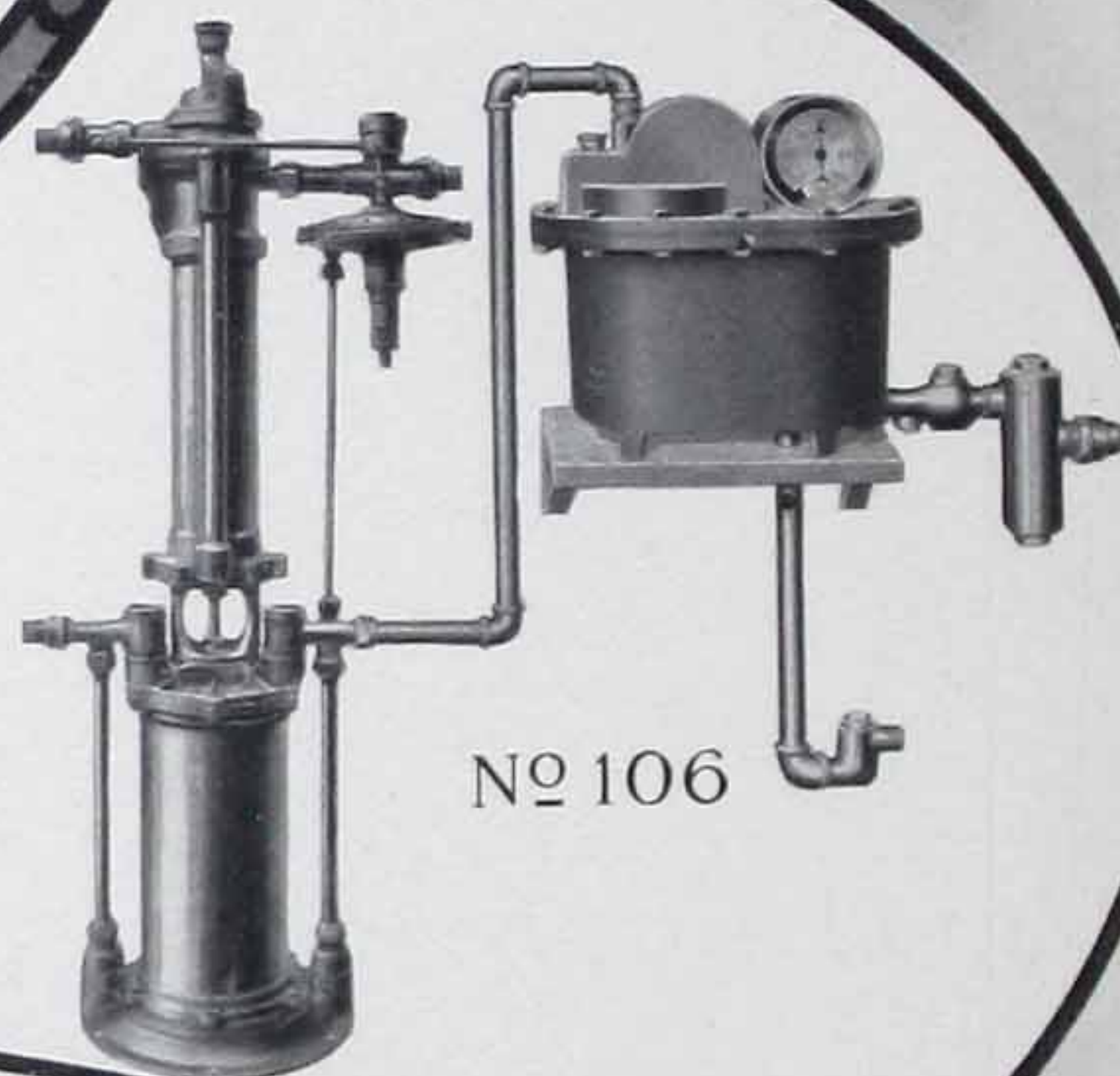
No 103-4



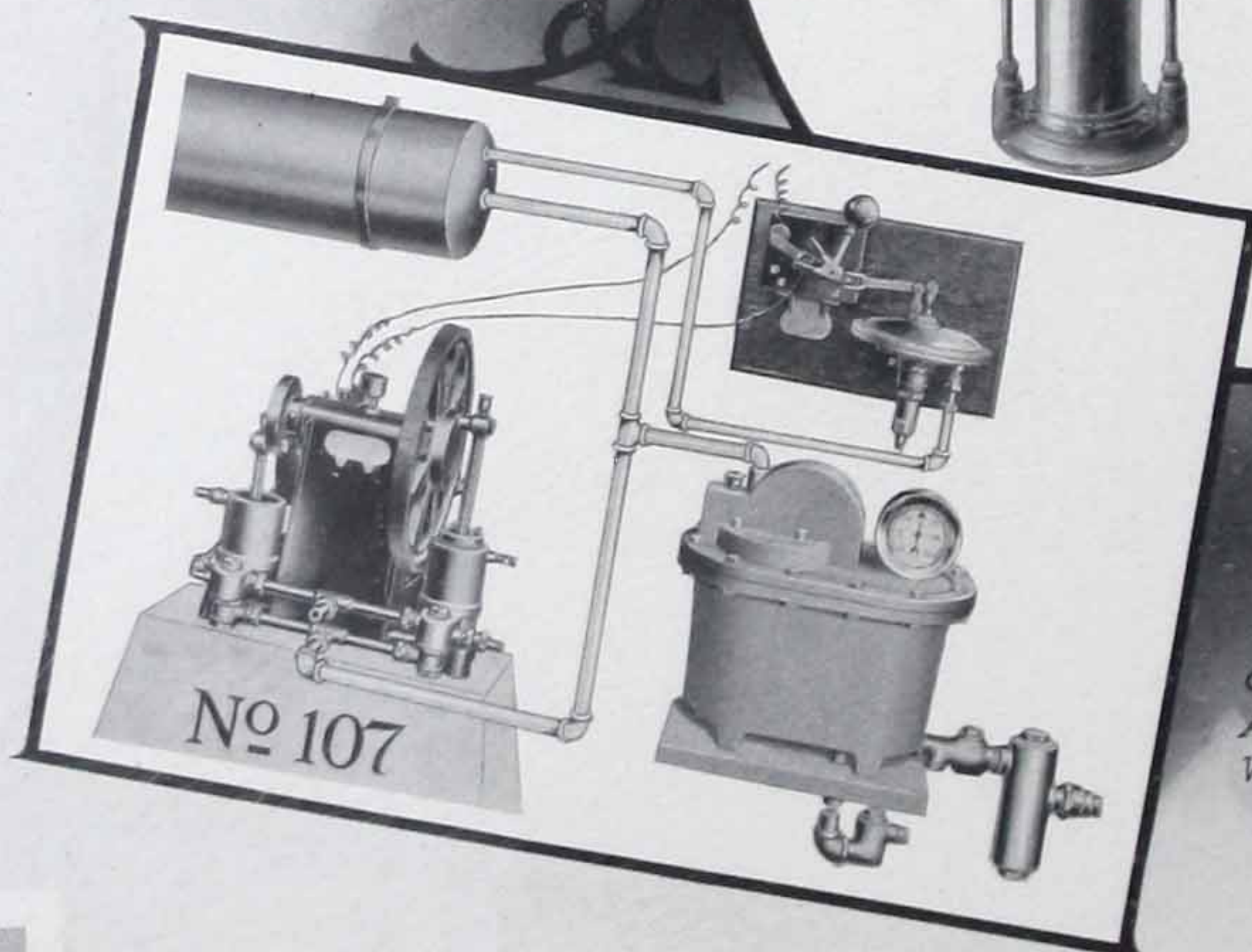
No 101

No. 101
Reliable Hydraulic
Vacuum Pump
*FOR RESIDENCES AND
SMALL APARTMENT HOUSES*

No. 106
Reliable Hydraulic
Vacuum Pump
FOR LARGE BUILDINGS.



No 106



No 107

No. 107
Reliable Electric
Vacuum Pump
*CAN BE USED IN PLACE OF
ANY OF THE HYDRAULIC PUMPS
WHERE ELECTRICITY IS PREFERRED*

Better Heat at Less Cost

by means of the

Reliable Vacuum System

THE Reliable Vacuum System saves fuel; assures immediate heat and equalized circulation, with every radiator doing full duty; does away with hammering noises; combines the advantages of the hot water system and ordinary steam, without the limitations of either and produces these results at practically no cost to operate.

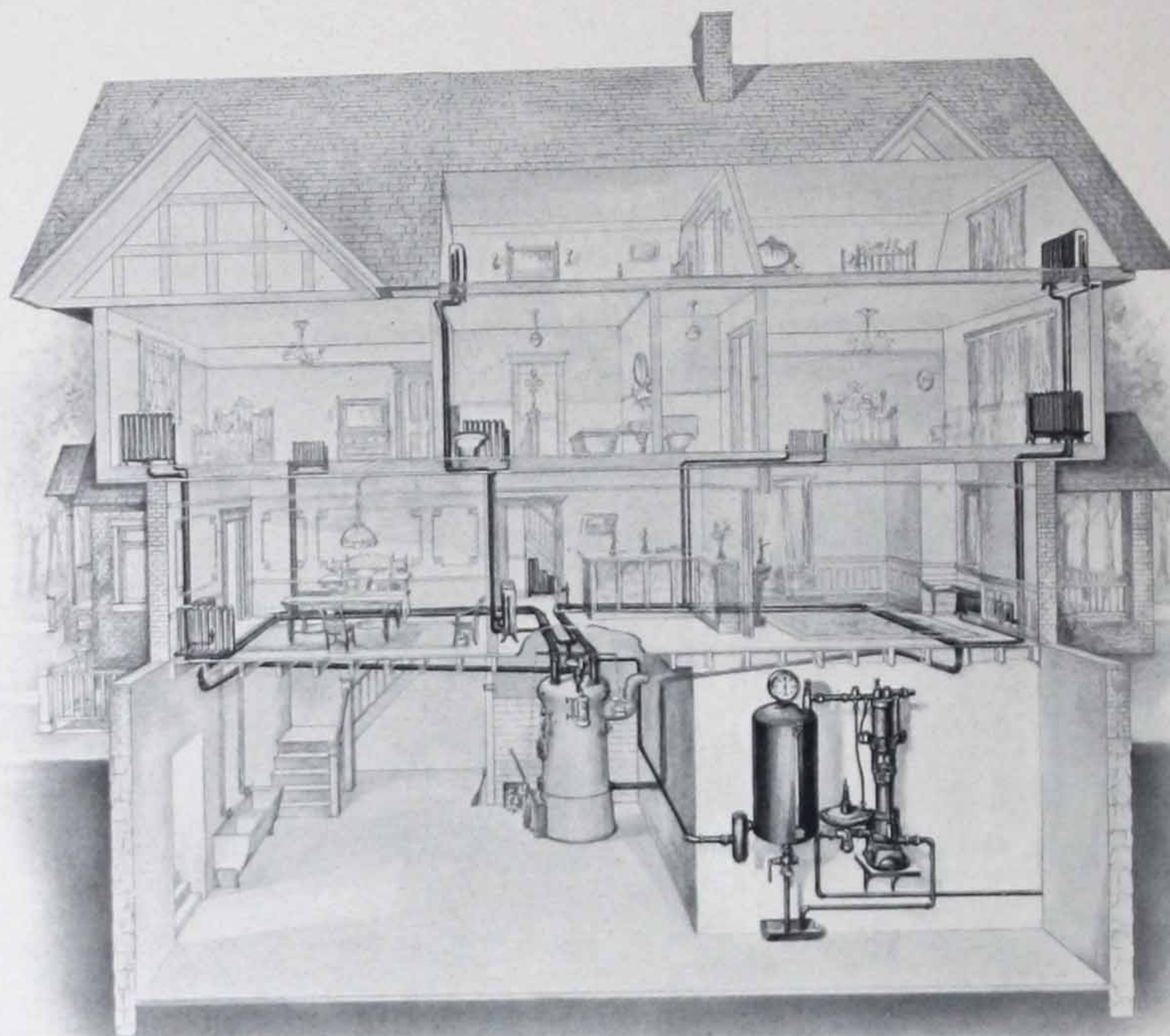
It can be profitably applied to either new or old steam heating plants of any size, whether steam is generated on the premises or furnished by a central station.

These advantages are not theories, but facts—so important, so full of possibilities that every user or prospective user of steam heat will do well to read the how and why as detailed in the following pages.



Joseph Birnbaum Building
Cleveland, Ohio
Using the Reliable Vacuum Pump

The Reliable
Vacuum
System
assures
comfort in
the home



The Reliable Vacuum System as applied to an ordinary single pipe steam system in a residence. The simplicity of the installation is apparent. Wall space occupied by the No. 101 Reliable Vacuum Pump and Condenser as illustrated is only $2\frac{1}{2}$ by 3 feet.

The Reason for the Reliable Vacuum System



OW the Reliable Vacuum System makes steam heat more efficient with less fuel will be more readily understood by first grasping the theory of vacuum steam heating.

The vacuum steam heating system is fundamentally the ordinary steam system plus some means of automatically exhausting air from the piping and radiators—in technical terms, producing and maintaining a partial vacuum in the heating system.

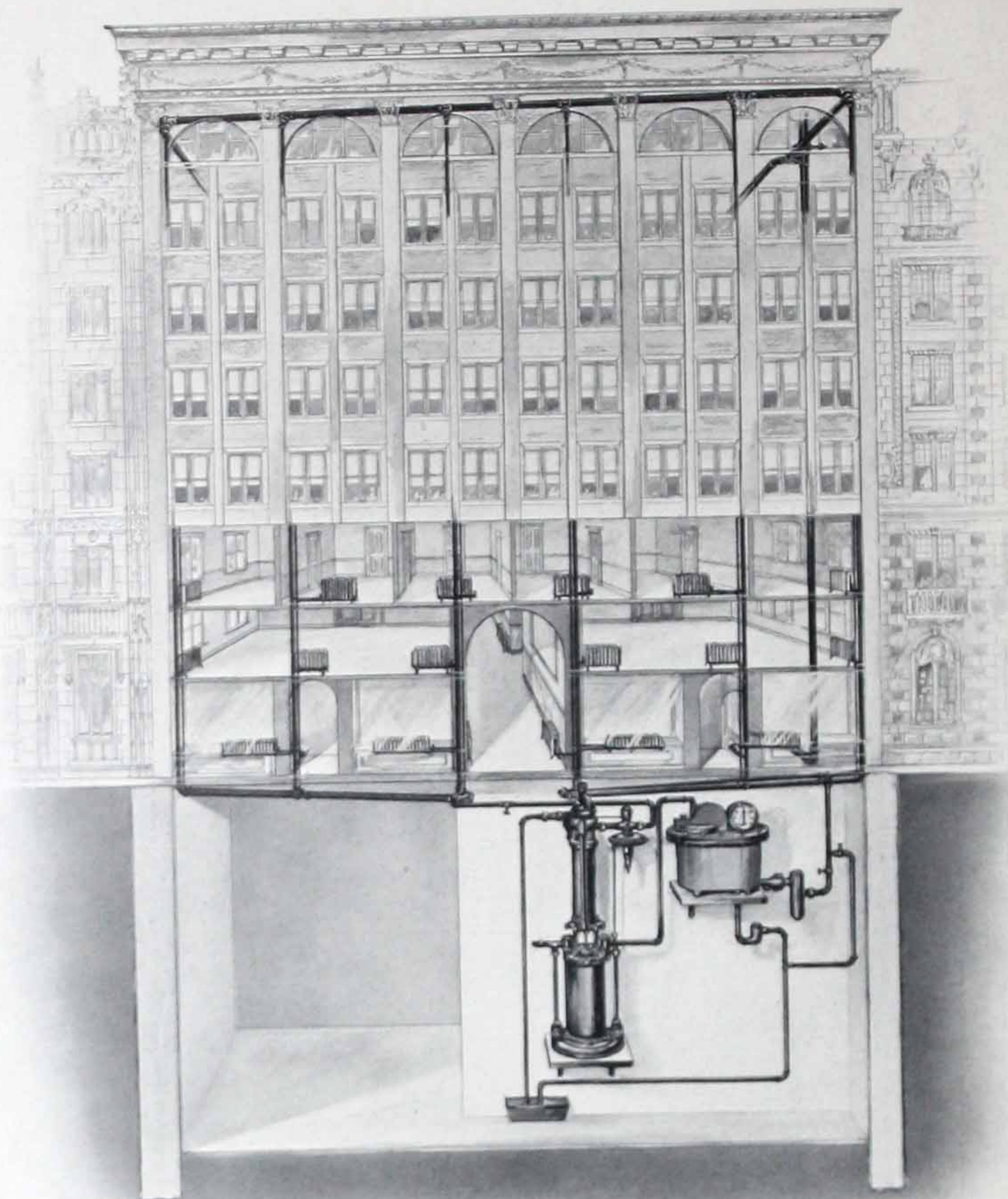
The theory of vacuum heating is based upon two thoroughly established physical facts:—

(1) In a perfect vacuum—barometrically rated at 30 inches—steam generates at a temperature of 98 degrees Fahrenheit. Under normal atmospheric pressure the lowest steam-generating temperature is 212 degrees. Steam is generated at intermediate temperatures between 98 degrees and 212 degrees by a lower fire—in other words at a saving of fuel.

(2) In a perfect vacuum, steam travels at the rate of about 1500 feet a second—faster than sound. In the ordinary steam heating system, the resistance of air in pipes and radiators is extremely great, and causes the steam to circulate very slowly.

It should be noted that a perfect vacuum is not necessary in practice; a vacuum of 5 to 8 inches will produce a positive circulation of steam in any system.

Reliable
Vacuum
System with
down-feed
steam
heating plant



Showing the Reliable Vacuum System, with No. 106 Reliable Hydraulic Vacuum Pump, as applied to down feed steam heating system in a typical office building. Steam can be either generated on premises or furnished by a central station.

The installation as shown in basement occupies a wall space approximately five feet square.

What the Reliable Vacuum System Is

THE Reliable Vacuum System consists of an air-suction or vacuum pump and condenser, which are located in the basement, and automatic air valves which are connected to the radiators. Air pipe connects the automatic air valves on radiators to the pump and condenser.

The purpose of the pump is to produce and maintain a partial vacuum in the heating system—in other words, to keep the pipes and radiators constantly free from air.

The automatic air valve permits the air to be drawn from the radiator by the pump, but closes when steam comes in contact with it. As the air valve is placed on the end of the radiator farthest from the steam inlet, steam cannot close it until all the air is removed, and the entire radiator filled with steam.

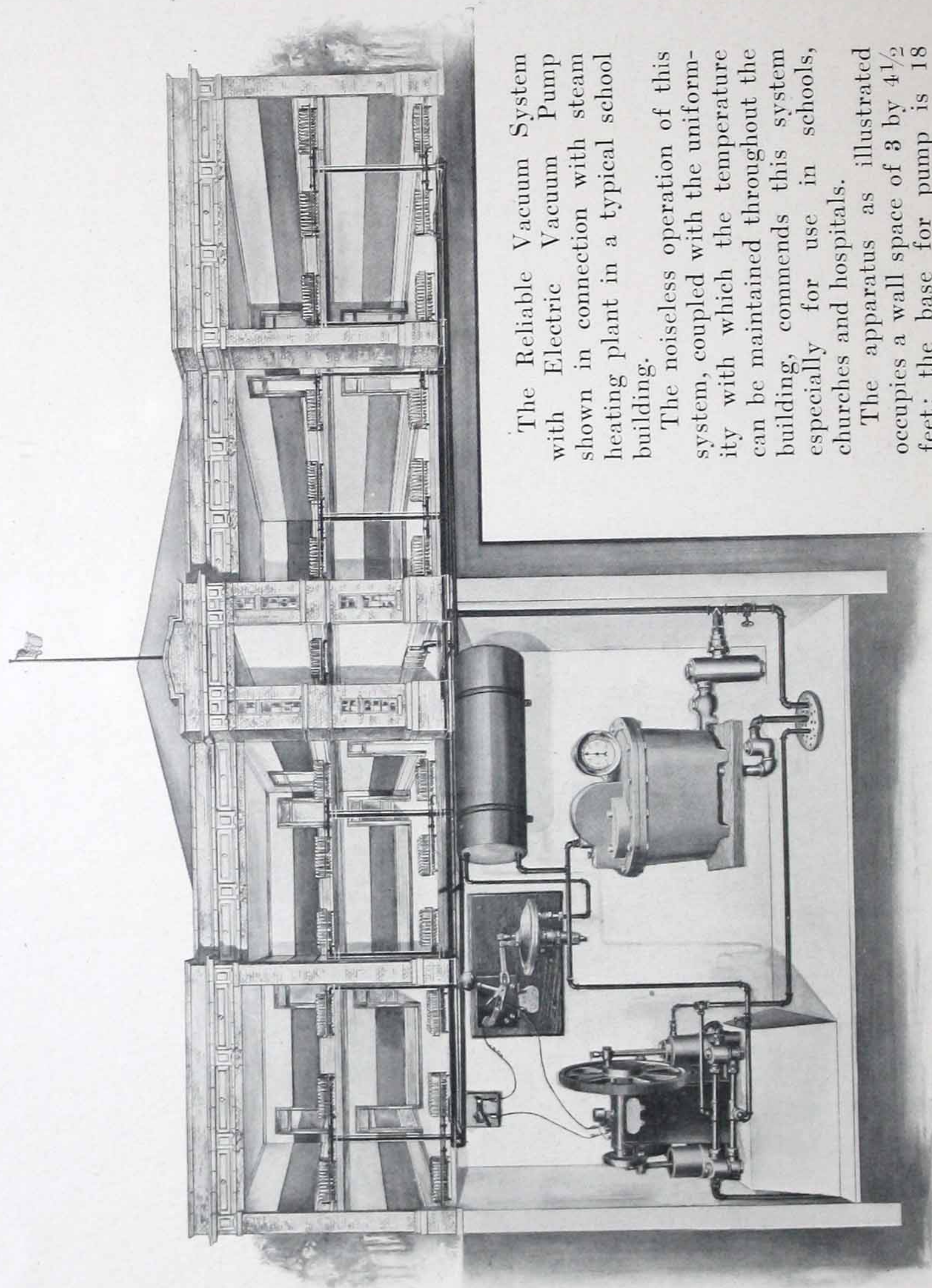
The condenser prevents, steam, water and foreign matter from entering the pump. This enables the pump to operate under ideal conditions, as nothing but air passes through it.

Reliable Vacuum Pumps are made in two types: one, operated by city water pressure, the other by electricity. They are mechanically simple, start and stop automatically, and require no attention.

The Reliable Hydraulic Vacuum Pump has two vertical cylinders—one for motive purposes, the other for exhausting air from the radiators.

The operation of the pump is governed positively by the cut-off which stops the pump automatically when the proper degree

Reliable
Hydraulic
Vacuum
Pump



The Reliable Vacuum System with Electric Vacuum Pump shown in connection with steam heating plant in a typical school building.

The noiseless operation of this system, coupled with the uniformity with which the temperature can be maintained throughout the building, commends this system especially for use in schools, churches and hospitals.

The apparatus as illustrated occupies a wall space of 3 by 4½ feet; the base for pump is 18 inches square.

of vacuum has been attained and starts it again when there is more air to be removed from the radiators.

The automatic cut-off insures economical operation of the pump, because it prevents the consumption of water except at times when the pump is pulling out the air.

The Reliable Hydraulic Vacuum Pump is made entirely of brass and phosphor bronze—cannot rust and is built to last a lifetime.

The Reliable Electric Vacuum Pump consists of two pumping cylinders compactly mounted with motor on a heavy base, with the pump back-gearred directly to the motor.

The Reliable Electric Vacuum Pump has no complicated parts to get out of order, and requires absolutely no attention with the exception of an occasional oiling. Is equipped with cut-off switch which automatically stops the pump when the air has been exhausted from the system, and starts it when air accumulates in the radiators.

Reliable Vacuum Pumps take up but small space; the hydraulic pump can be fastened to the wall; when so affixed, the largest size of pump projects only twelve inches. In height, the different sizes vary between 25 and 42 inches.

A foundation for the electrically driven pump will only occupy floor space eighteen inches square, and the pump itself is but 16½ inches high; auxiliary apparatus, such as condenser and expansion tank, can be fastened to the wall, out of the way.

Reliable
Electric
Vacuum
Pump

Requires
small
space



The Reliable
Vacuum
System Costs
practically
nothing
to operate

LOMBARD RESIDENCE
HIGHLAND PARK
CHICAGO, ILL.



GRANT ROHRER'S
RESIDENCE
NEW YORK N.Y.



ALL SAINTS CATHEDRAL
AND GUILD HALL
MILWAUKEE WIS.



B.O. ENGINEERS BLDG.
CLEVELAND, O.



MONTGOMERY COUNTY HOSPITAL
INDEPENDENCE, KAS.



ROSALIND APARTMENTS
KANSAS CITY KAS.



DAVID C. WHITNEY RESIDENCE
GROSSE POINT FARM, MICH.



TEMPLE AND SOCIAL CENTER BLDGS. OF N. CHICAGO
HEBREW CONGREGATION CHICAGO, ILL.



What the Reliable Vacuum System Does



THE Reliable Vacuum System produces the immediate heating of every radiator in the building, regardless of distance from the boiler.

The removal of dead air from all radiators and pipes by the Reliable Vacuum Pump does away with resistance to the inflowing steam. Where the Reliable Vacuum System is used, the air is *pulled* out of the system instead of being *pushed* out by the steam. The steam travels to every part of the system instantly—no waiting for one radiator to heat before the steam reaches a radiator in another room.

The absence of air from the radiator also means that the radiator itself becomes heated much more rapidly, and that every square inch of its surface is effective heating surface. In the ordinary steam system, air-pockets in the radiators practically insulate a portion of the radiator surface from the heat of the steam.

The Reliable Vacuum System equalizes the circulation of the steam. The pump exhausts air from *every* part of the heating system, and steam rushes in to fill the void. There are no “dead ends”—every radiator does full duty.

This fact alone will justify the application of the Reliable Vacuum System to heating plants when slow-heating or “lead” radiators have given trouble.

The application of the Reliable Vacuum System to a steam heating plant combines the advantages of hot water heating with

Quick
heat

Each
radiator
more
efficient

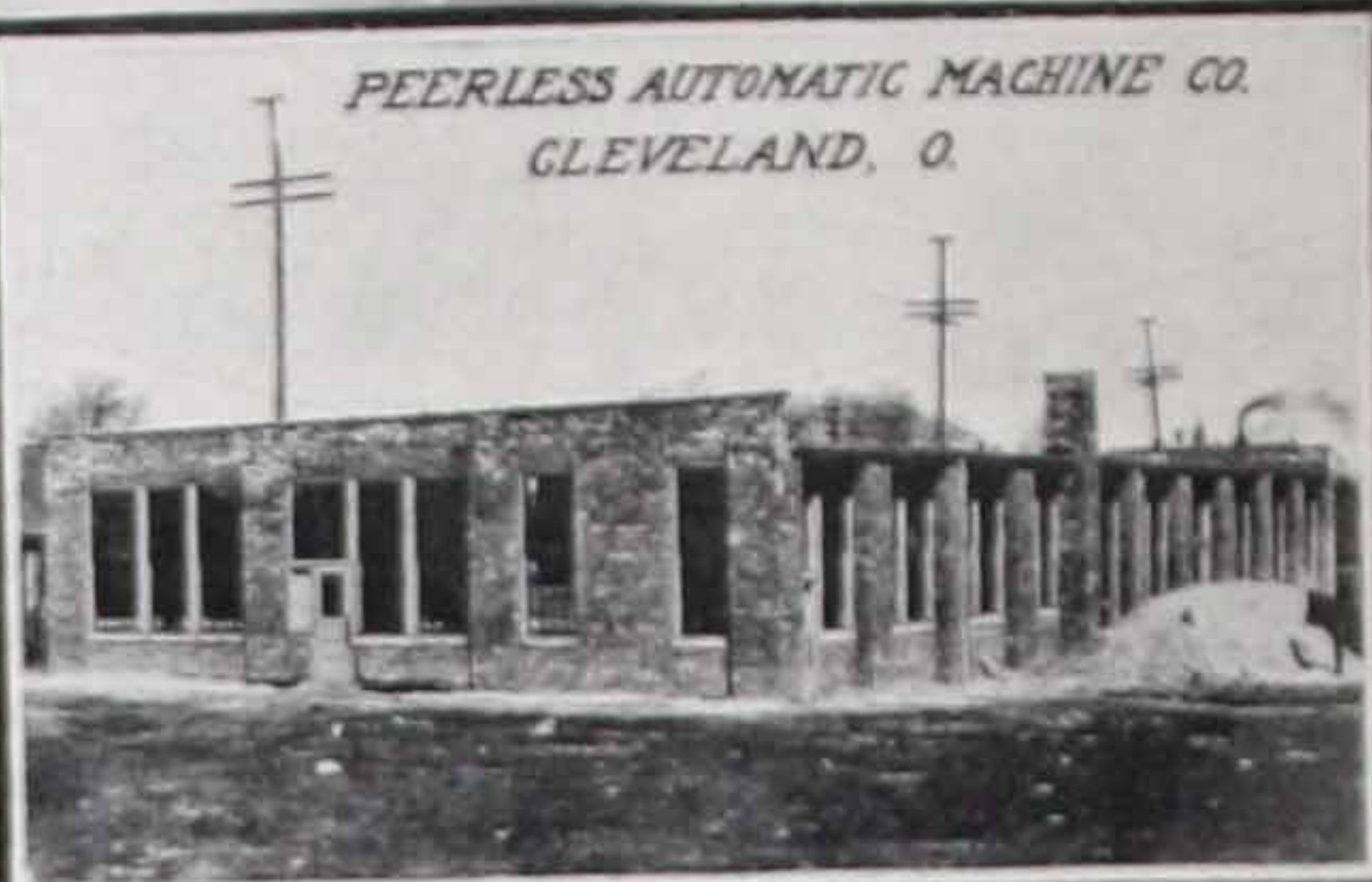
No dead
radiators

Combines
advantages
of hot water
and steam

The Reliable
Vacuum
System
carries no
royalties



GRACE CHURCH AND SCHOOL
MILWAUKEE, WIS.



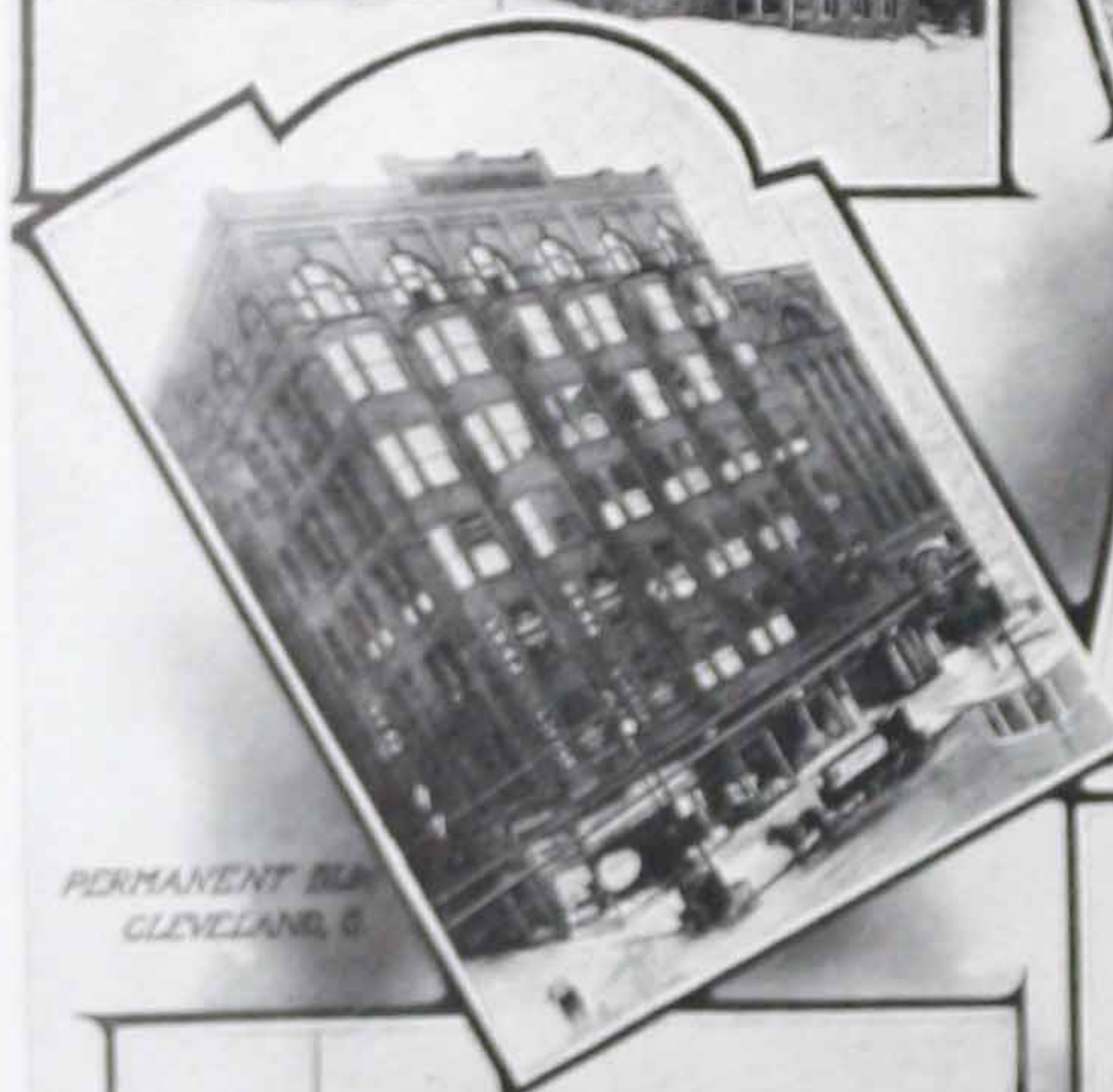
PEERLESS AUTOMATIC MACHINE CO.
CLEVELAND, O.



RALPH CONNABLE
BUFFALO, N.Y.



OAK HILL COUNTRY CLUB
ROCHESTER, NY.



PERMANENT BLDG
CLEVELAND, O.



THE BROWN EAGER & HULL CO. BLDG.
TOLEDO, OHIO.



EXCHANGE HOTEL UTICA, N.Y.



BURLINGTON APTS. ST. LOUIS, MO.

those of ordinary steam heating, coupling the low temperature range of hot water with the high temperature of steam.

The lowest possible temperature at which steam can be generated in the ordinary steam system is 212 degrees. This heat is excessive in moderate weather, and must be tempered by opening doors and windows. In other words, with the ordinary steam system you have to supply a definite quantity of heat to get any at all; if this quantity happens to be more than you need on a mild day, you are obliged to throw part of it away.

On the other hand, even with the thirty-five to forty per cent additional radiation that the hot water system has, it is often found inadequate during severe weather.

The Reliable Vacuum System enables you to provide just the amount of heat required, regardless of weather conditions, mild or severe.

The radiator temperature is controlled absolutely by the amount of the fire, only a slight increase being necessary for the coldest weather.

The increased pressure necessary can be measured in ounces, in contrast with the pounds required with the ordinary steam system.

With the Reliable Vacuum System you can maintain a comfortable room temperature in mild weather by generating steam at temperatures low enough to do away with overheating.

This is accomplished in the Reliable Vacuum System by moderating the fire to suit conditions; the boiling point of the water—the temperature at which steam generates—becomes lower as the fire is moderated. In the partial vacuum produced, steam can be supplied to every radiator 30 degrees, or more, cooler than with the ordinary steam system, where a moderation of the fire means no steam at all. Thus there need be no overheating in mild weather.

This combination of the advantages of hot water and steam is accomplished, too, without certain definite disadvantages of either.

No lack
of heat

No excess
of heat

Eliminates
disadvan-
tages

The Reliable
Vacuum
System is
specified by
leading
architects
everywhere



DODGE BLDG.
DETROIT, MICH.



ST. PROKOPS SCHOOL
CLEVELAND, O.



SYMON'S WAREHOUSE
SAGINAW,
MICH.



ST. MARY'S CHURCH
UTICA,
N. Y.



MC CABE CHURCH
CHICAGO, ILL.



F.A. FORSEMAN'S RESIDENCE
CHICAGO, ILL.



RAUB RESIDENCE
INDIANAPOLIS, IND.



RUSSCO APARTMENTS
ST. LOUIS, MO.

Hot water is a sluggish heat-conveying medium as compared with steam in a vacuum. Where the **Reliable Vacuum System** is applied, a building can be heated in minutes where hot water would take hours.

Much less radiation is required with the **Reliable Vacuum System**; the excessive amount needed with the hot water system is not only unsightly in appearance, but takes up valuable space.

Furthermore, with the hot water system there is always danger of leakage, and of pipe-freezing when the system is not in operation.

The **Reliable Vacuum System** does away with the hammering noises which are almost universally recognized as an unavoidable evil in connection with the ordinary steam heating system.

With the **Reliable Vacuum System** there is no drip from air valves, to spoil floors and ceilings; no offensive odors, or hissing noises as there are where the ordinary steam system is used without drip-pipes.

The application of the **Reliable Vacuum System** makes fuel bills at least one-quarter less than with the ordinary steam system; in many cases where this system has been applied, the resultant fuel saving has been as high as 40 per cent.

This great fuel saving is explained by three facts:—

(1) The **Reliable Vacuum Pump** *pulls* the air out of all pipes, radiators and coils.

In the ordinary steam heating system, the steam *pushes* the air out and a portion of the heat of the steam is converted into energy. Fuel consumed in generating power to push out the air is wasted absolutely.

(2) The **Reliable Vacuum System** makes every square inch of radiation effective heating surface. Where a radiator is one-third full of air, only two-thirds of its surface is radiating heat.

The **Reliable Vacuum System** makes it impossible for air to accumulate in radiators; every radiator becomes 100 per cent efficient.

No drip
or odors

Saves
fuel

Pulls the
air out

Makes
radiators
100%
efficient

The Reliable
Vacuum
System pays
for itself
many times
over



FIRST NATL. BANK BLDG.
FORT DODGE-IOWA



HOTEL MEALEY
OELWEIN - IOWA



AVENUE THEATRE
E. ST LOUIS - ILL.



BELL TELEPHONE BLDG. - CLEVELAND



GRIFFITH RESIDENCE
FORT WAYNE-IND.



PRINCESS MFG. CO.
DETROIT-MICH.



FENTRESS TERRACE - CLEVELAND



DOMINION COLLEGE - SAN RAFAEL
CALIFORNIA

(3) The Reliable Vacuum System saves fuel that is wasted in overheating with the ordinary steam system. As previously explained, the Reliable Vacuum System makes it possible to generate steam at lower temperatures in mild weather.

(4) With the Reliable Vacuum System it is never necessary to carry pounds of steam pressure; ounces of pressure are adequate for the most severe weather. During the greatest part of the heating season it is possible to provide ample heat with steam generated at less than atmospheric pressure. Vacuum-generated steam, even at its correspondingly lower temperatures, furnishes as much heat as steam at positive pressures in the ordinary steam system, because of the added efficiency which the Reliable Vacuum System gives to all radiators.

No waste
from
overheating

Ounces
of steam
pressure



BENNET & FISH.
CLEVELAND, O.



WEBER'S RESTAURANT
CLEVELAND, O.



CUYAHOGA BLDG. CLEVELAND, O.

One Reliable
Vacuum
Pump does
service for
these three
buildings;
steam sup-
plied by
central
station

The Reliable
Vacuum
System
means a
warm
building in
minutes
instead
of hours



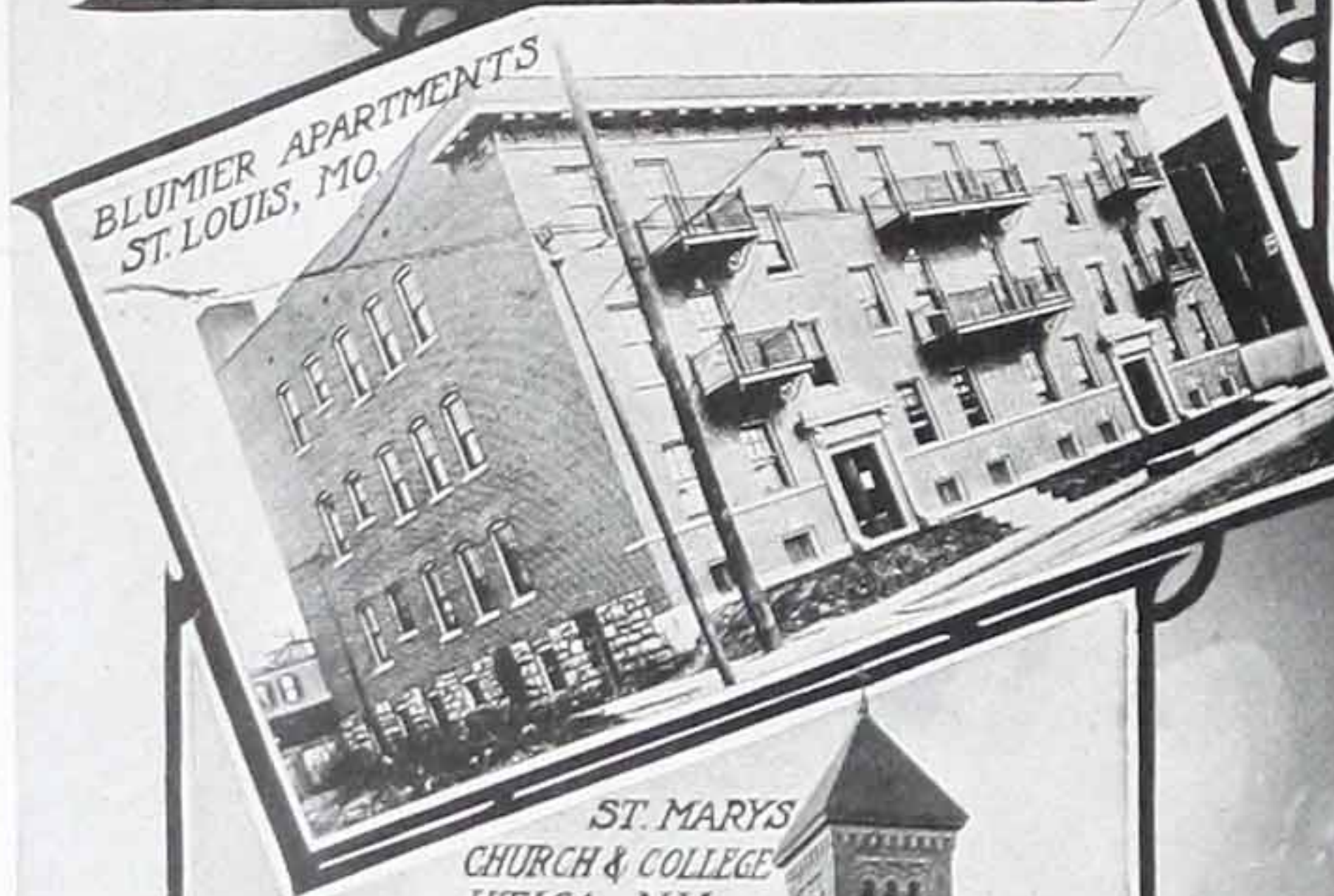
MR. HARRIS'S
RESIDENCE
CHICAGO, ILL.



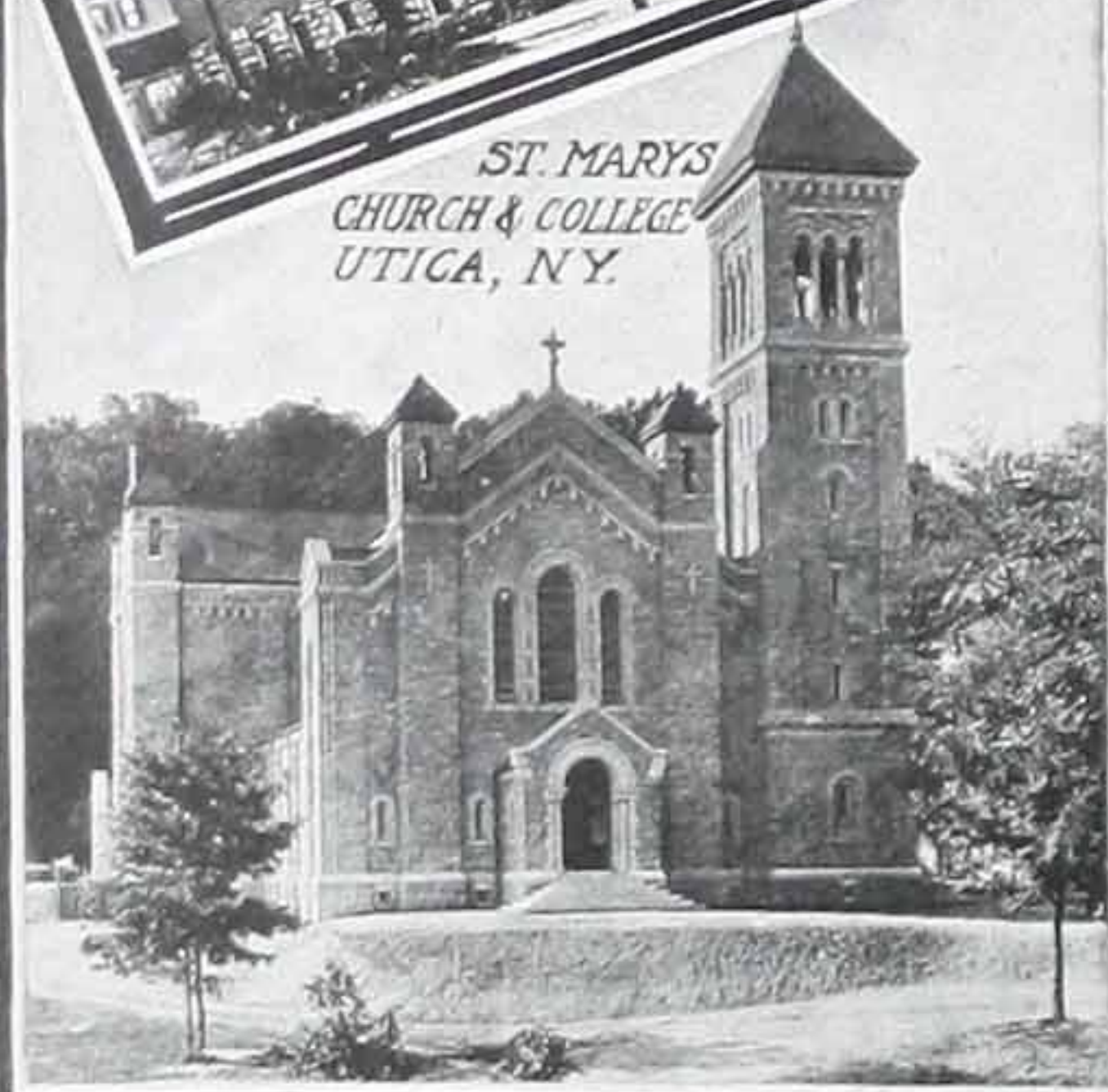
STRATFORD HOSPITAL STRATFORD ONT., CANADA



GRISWOLD HOTEL
DETROIT, MICH.



BLUMIER APARTMENTS
ST. LOUIS, MO.



ST. MARYS
CHURCH & COLLEGE
UTICA, N.Y.



SOCIETY FOR
SAVINGS BLDG
CLEVELAND



DR. FITCH'S RESIDENCE ROCHESTER, N.Y.



KIMO SPECIALTY CO. BUFFALO, N.Y.

How the Reliable Vacuum System Operates

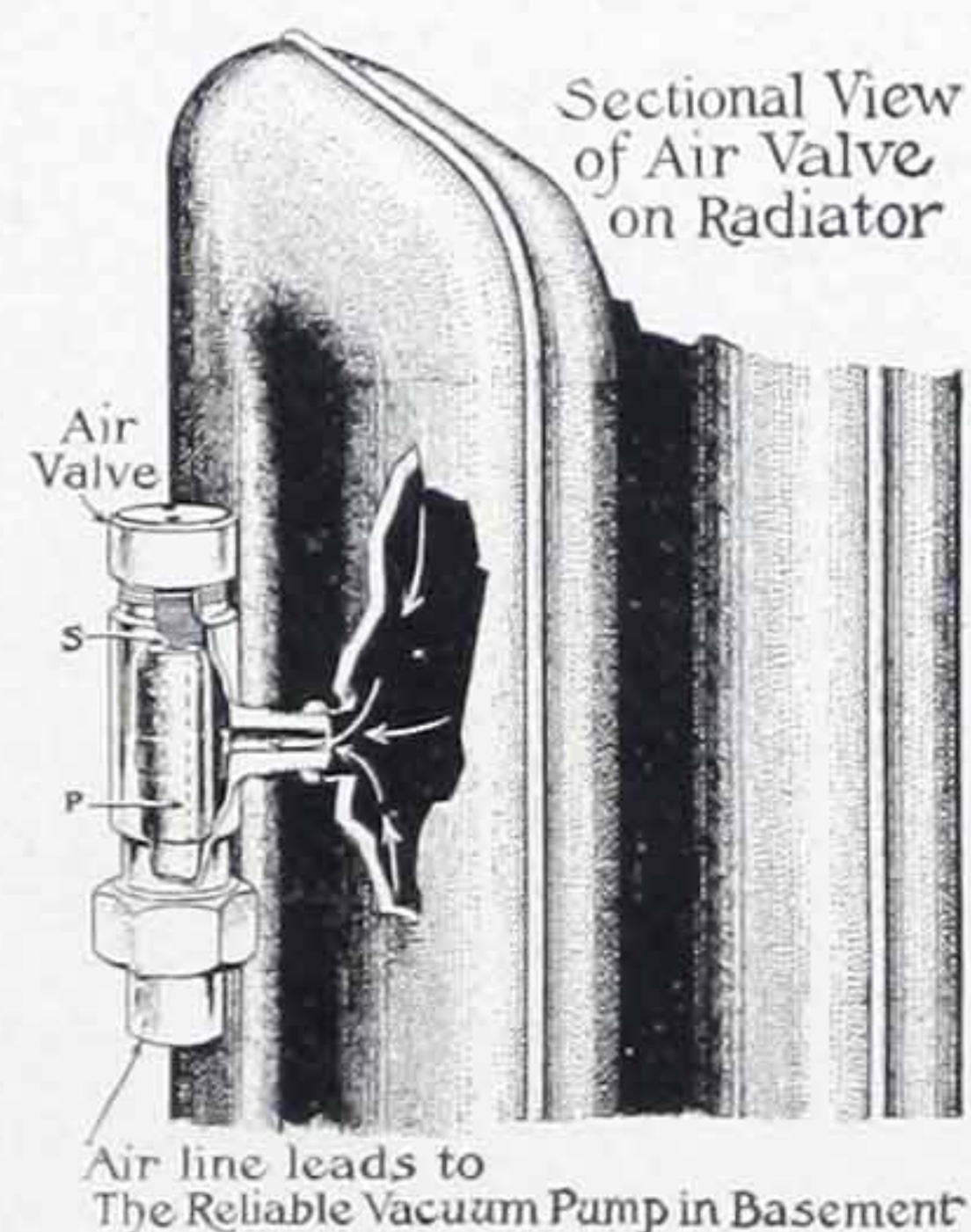
THE operation of the Reliable Vacuum System is entirely automatic. To place the system in operation, it is only necessary to turn on water where the Reliable Vacuum Pump is used, or to close a switch where the Reliable Electric Vacuum Pump is installed.

The operation of the Reliable Vacuum System in connection with a steam heating plant is as follows:—

The pump should be placed in operation when the fire is first started under the boiler. The air valves are open when cold and the pump exhausts air from the entire system—radiators, piping and boiler—putting it under a partial vacuum. Steam begins to generate long before the water becomes hot enough to boil at atmospheric pressure, and is instantly pulled by the suction of the pump into every radiator, expanding into the space that was previously filled with air. When steam comes in contact with the air valves on the radiators, the valves close.

The principle upon which the automatic air valve operates can be easily understood by reference to the accompanying illustration.

The expansion post “P” is made of a carbon composition, which expands as it becomes heated.



Absolutely
automatic

The
automatic
air valve

The
Reliable
Vacuum
System
makes
satisfied
tenants

DUTCH REFORMED CHURCH
ROCHESTER
N.Y.



ROCK BLDG. CLEVELAND, O.



WALLACE RESIDENCE
SAGINAW, MICH.



VISIGH RESIDENCE
CHICAGO, ILL.



EPWORTH MEMORIAL
CHURCH
CLEVELAND, O.



ST. MARYS LYCEUM
BUFFALO, N.Y.



LAMSON BROS. BLDG. TOLEDO, O.



HIGH SCHOOL. PORT HURON, MICH.

Before the radiator becomes filled with steam, the expansion post being cold is in a contracted state, and the air passage "S" is open. This permits the **Reliable Vacuum Pump** to pull out the air, which follows the course indicated by the arrows.

As steam comes in contact with the air valve after all the air has been removed from the radiator, the post expands, closing the air passage and preventing any steam being drawn through the valve.

As the steam condenses in the radiator and the expansion post cools, it contracts, permitting any air in the radiator to be drawn off by the **Reliable Vacuum Pump**.

When the air has been exhausted from the system, the **Reliable Vacuum Pump** stops automatically and does not operate again until there is more air to be removed from the radiators. In a tight system, the pump has only to exhaust the air which is liberated from the water in the boiler.

This explains why the cost for water and power to operate **Reliable Vacuum Pumps** cannot exceed a few cents a day, even where a large amount of radiation is used, and cannot be measured in cents per day with a small amount of radiation.

The **Reliable Vacuum Pump** can operate only where there is air to be removed from the radiators. When the vacuum reaches the required point, the automatic cut-off stops the pump; when the vacuum drops below the set point the pump begins to operate.

A few strokes of the pump an hour will maintain the proper degree of vacuum in a tight system where air valves are properly adjusted.

There are many **Reliable Vacuum Systems** installed where several strokes of the pump every three or four hours keep the radiators free from air, making the operating cost practically nothing.

Operating
cost
practically
nothing

The Reliable
Vacuum
System is
adapted to
any type of
building

MARSTON RESIDENCE
APPLETON,
WIS.



EUGLID HOTEL
CLEVELAND



CUYAHOGA COUNTY COURT
HOUSE, CLEVELAND



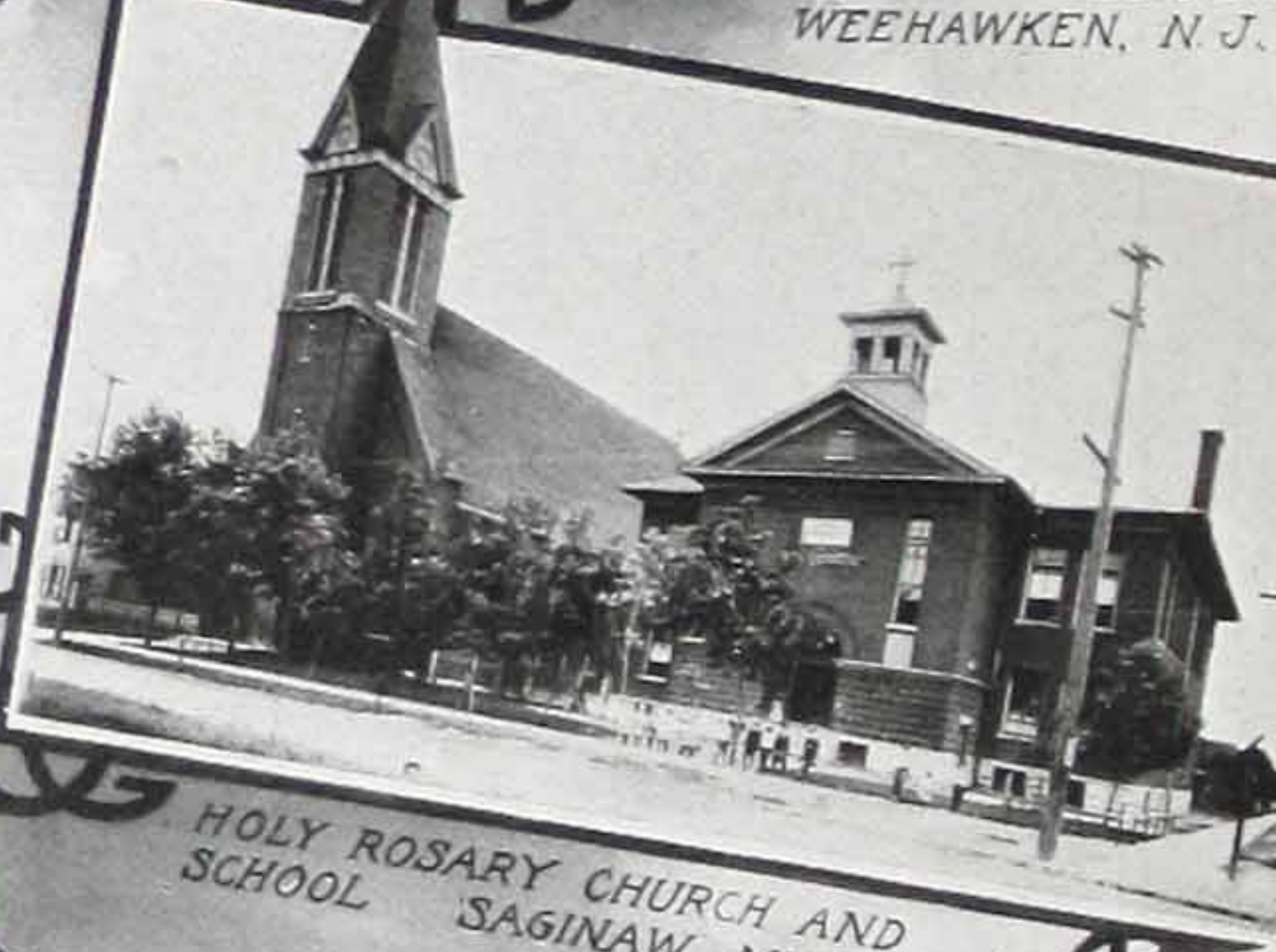
H. ROEDE RESIDENCE
WEEHAWKEN, N. J.



SCHUMACHER BLDG.
JERSEY CITY



HOLY ROSARY CHURCH AND
SCHOOL SAGINAW, MICH.



BENJAMIN APARTMENTS
ST. LOUIS



ST. JOE HOSPITAL
SOUTH BEND, IND.



Cost to Install the Reliable Vacuum System



THE Reliable Vacuum System is inexpensive to install in connection with either new or old steam heating plants.

A new steam heating plant equipped with the Reliable Vacuum System costs less than the corresponding hot water system, and but little more than the ordinary steam system.

In applying the Reliable Vacuum System to an existing heating plant it is only necessary to equip the radiators with automatic air valves, and make connection between these and the pump with air piping.

Where the existing system is already equipped with drip or air-lines, this can be connected direct to the pump at very small cost.

The Reliable Vacuum System will more than pay for itself in fuel saved, and in the satisfaction derived from the ideal heating results which it produces.



Francis T. Sarmiento's Residence
Alington Place, Detroit, Mich.
Using the Reliable Vacuum Pump

Less
than
hot water

Application
to existing
systems

Where to get the Reliable Vacuum System



ANY heating contractor can furnish and install the Reliable Vacuum System.

If the heating contractor or architect, whom you consult is not informed, write us direct, and we will put you in touch with the nearest one on our special list of experts whom we recommend as reliable and capable.

Our engineering department is at your service for the consideration of any special problems involved; and if there is any feature of the Reliable Vacuum System that is not entirely clear to you, a letter from you will be given special attention by us.



THE BISHOP-BABCOCK-BECKER CO.

49th Street and Hamilton Ave.,	-	Cleveland
439-441 Lafayette Street,	-	New York
219-225 West Washington Street,	-	Chicago
56-60 East Fifth Street,	-	St. Paul
229 Cedar Street,	-	Milwaukee
Washington and Causeway Streets,	-	Boston
Broadway and Beaver Streets,	-	Albany
16th Street and Sherman Drive,	-	Indianapolis
225-227 West Fourth Street,	-	Cincinnati
1106 Commerce Street,	-	Dallas
210-212 South Broadway,	-	St. Louis
960-962 Mission Street,	-	San Francisco

[BLANK PAGE]



CCA

